



RESEARCH & DEVELOPMENT MANUAL

Georgia Department of Transportation
Office of Research
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PREFACE TO THE FOURTH EDITION

Transportation research is an integral part of the Georgia Department of Transportation (GDOT) mission to provide a safe, seamless, and sustainable transportation system that supports Georgia's economy and is sensitive to its citizens and environment. The GDOT Research and Development (R&D) Program is developed and administered by the R&D Branch of the Office of Research (OR). R&D has played an important role in keeping GDOT on the cutting edge of technology through applied research touching the entire scope of GDOT activities.

GDOT's broad-based research program continues to diversify, as transportation research needs change with the times. To ensure that the most pertinent and highest priority research is conducted, OR works closely with management and other staff across GDOT to develop projects that will be successfully implemented upon completion with lasting, tangible benefits to Georgia. New projects are initiated regularly, and management and other staff are involved with projects throughout their development, conduct, and implementation.

An aggressive transportation research program is vital for agencies to stay abreast of technological change in the present, but it also yields long-term benefits in the future at comparatively low cost. This edition of the *Georgia DOT Research & Development Manual*, which summarizes the research program, has been prepared to ensure that the R&D Branch will continue to develop, manage, and implement strategic research that benefits the citizens of Georgia.

INTRODUCTION

This manual is the fourth edition of the *Georgia DOT Research & Development Manual* and was prepared by the Research and Development (R&D) Branch of the Office of Research. This manual provides a general description of GDOT's formal R&D Program, including its activities, policies, and procedures, in cooperation with the Federal Highway Administration (FHWA). The manual is intended for use by GDOT management, FHWA Georgia Division staff, public and private research personnel, GDOT research staff, and others involved in GDOT research. It contains nine sections and a set of appendices, all of which are introduced below.

Section 1 is an overview of the GDOT Research & Development Program and explains its mission, scope, and organization. Section 2 covers the roles and responsibilities of executive management, the Research Advisory Committee, Research Technical Advisory Groups, R&D Branch staff, and others involved in GDOT research activities. Section 3 covers the numerous aspects of initiating and executing projects, including project funding and programming. Policies related to performance of research are discussed in Section 4, and Section 5 summarizes GDOT approaches to research implementation.

Section 6 defines the various types of reports required for research funded by GDOT. Section 7 describes the national research activities in which GDOT participates, including the Transportation Research Board, the National Cooperative Highway Research Program, and the Transportation Pooled Fund program. Section 8 describes the research program Peer Exchange requirements and process. Section 9 provides a quick reference to ongoing research projects, reports, and program information. The appendices include important documents referred to in Sections 1 through 9.

SECTION 1.0

OVERVIEW OF GEORGIA DOT RESEARCH & DEVELOPMENT PROGRAM

1.1 GEORGIA DOT RESEARCH & DEVELOPMENT MISSION AND OBJECTIVES

GDOT provides a safe, seamless and sustainable transportation system that supports Georgia's economy and is sensitive to its citizens and environment. In support of this mission, GDOT supports a formal R&D Program to develop, evaluate, and implement those methodologies and technologies for the improvement of GDOT activities. R&D Program activities are directed toward supporting GDOT's strategic goals.

1.2 HISTORY

Research and development activities have been conducted in GDOT since the late 1950s. From that time until 1967, research was an informal program and consisted mainly of contracts with universities to perform the work. Little in-house research was conducted. Most of the research during this period related to materials and construction.

In 1967, a full-time research and development engineer was employed, a research advisory committee established, and a formal R&D Program established under the Office of Planning. During the following years, the Office of Materials and Research (OMR) was established (1975), and materials and research activities were combined into this new office. Today, R&D has a multi-disciplined staff to meet the research needs of GDOT.

Four other events since 1991 have occurred that relate to the R&D Program.

- The Intermodal Surface and Transportation Equity Act of 1991 (ISTEA) contained a directive that 2% of Federal-aid Highway appropriations to each state be used for planning and research activities. This requirement has continued in subsequent transportation bills. Currently, 23 CFR Part 420 describes federal guidelines for State Highway Agency (SHA) research programs and proper management of SHA research funds. 23 CFR 420.107 requires expenditure of no less than 25% of these State Planning and Research (SP&R) funds for R&D activities. This essentially ensured a consistent and dedicated R&D budget for GDOT each year.
- The Georgia Transportation Institute (GTI), a consortium of state universities engaged in transportation research and education, was formed in 1998, with funding from GDOT R&D and administered by Georgia Institute of Technology (hereafter Georgia Tech) via contract with GDOT.
- GTI was named a USDOT National University Transportation Center (UTC) in 2006. The goal of the UTC is to contribute to the national and state transportation knowledge base through research, education, and technology transfer. Since GTI's designation as a UTC, it is now referred to by GDOT, and in this manual, as "GTI-UTC."
- The Office of Research was formed in September 2012, separating from the Office of Materials and Division of Construction and joining the Division of Organizational Performance Management.

1.3 ORGANIZATION AND FUNCTIONS

1.3.1 Organization

The R&D Branch is the primary organizational element in the formal R&D Program. The R&D Branch is one unit of the Office of Research (OR), which is part of the Division of Organizational Performance Management. The R&D function is organized as follows:



1.3.2 Scope of Research Activities

Research is conducted in all areas of GDOT operations. All GDOT research is applied toward an implementable product, rather than “basic” or theoretical research, and is aimed at problem solving. Research activities may be short-range or long-range depending upon the scope of the research.

The R&D Program consists of those projects and activities administered by the R&D Branch. Research is conducted (1) *in-house* by OR personnel, other GDOT offices, or OR in cooperation with other GDOT office(s); or, (2) by *contract* with consulting firms, research organizations, universities, and other government agencies.

In-house and contract research projects fall into one of two categories:

1. **Research Project:** a formal project approved by the Research Technical Advisory Groups (see Section 2.4) with a detailed proposal approved by the appropriate GDOT office(s).
2. **GDOT Special Research Study (SRS):** a formal project, generally with a smaller scope of work than a Research Project, which has time urgency and a cost not exceeding \$75,000. SRS projects are approved by the State Research Engineer.

Each project is initiated with a scope of work that describes project goals and deliverables. It also provides the expected schedule of the project and an implementation plan.

GDOT also participates in certain national research activities such as the Transportation Research Board (TRB), National Cooperative Highway Research Program (NCHRP), and the Transportation Pooled Fund (TPF) Program. All of these programs are administered by R&D and are discussed in later sections of this manual. Finally, in addition to research activities, the R&D Program also includes operation of the GDOT Library at OR, which plays an important role in collection, retention, and transmission of research information.

1.4 FUNDING RESEARCH

The GDOT R&D Program is funded from a primary source and several secondary sources. The primary source is the federal State Planning and Research (SP&R)

program funds previously described. The FHWA provides SP&R funds on a federal-state matching basis of 80% federal and 20% state.

On occasion, FHWA Georgia Division may provide 100% federal funds for certain national research activities. Secondary sources include other federal agencies, such as the U.S. Geological Survey, which may provide funds for research projects. Eligibility requirements for use of SP&R funds are included in the Code of Federal Regulations (CFR), Title 23 (23 CFR 420.113).

1.5 PROGRAMMING RESEARCH

The annual GDOT R&D Work Program is the formal statement of research activities that GDOT intends to undertake using SP&R funds. It is prepared and submitted in accordance with 23 CFR 420.111. Programming of the R&D Work Program occurs on a fiscal year (July 1 through June 30) basis. This Work Program is submitted to FHWA for approval in spring each year so that the funds can be approved through work authorizations for the administrative portion of the program for use beginning July 1st of that year. The program is composed of the following categories.

- **Research Administrative Activities.** These are subdivided into the line items of (1) General Administration; (2) Implementation; (3) GDOT Library; and (4) Special Research Studies.
- **National Studies.** SP&R funds are also used to fund GDOT participation in NCHRP, TRB, and TPF activities. These programs utilize 100% federal SP&R funds. NCHRP and TRB funds are programmed once a year, while pooled-fund projects are programmed as needed. Other funds obtained from

FHWA, other federal agencies, and others for research work are programmed on an individual project basis as needed.

- **Proposed Projects.** Estimated funding is allocated for new projects to be initiated in the coming fiscal year. New projects, or changes in existing ones, will be added to the Work Program during the fiscal year. Funds for new projects are allocated on a project-by-project basis or via master contracts.

SECTION 2.0

ROLES AND RESPONSIBILITIES IN THE GEORGIA DOT R&D PROGRAM

As an integral part of the overall GDOT mission, GDOT management and staff are involved in the R&D Program. These include individuals, committees, and units. The responsibilities of each are described in the following paragraphs.

2.1 COMMISSIONER

The Commissioner is the chief executive officer of GDOT. He approves the R&D Work Program and executes research contracts.

2.2 OTHER DEPARTMENT TOP MANAGEMENT

The Chief Engineer and the Director of the Division of Organizational Performance Management (hereafter OPM) also participate in the R&D Program. The Office of Research is part of the Division of OPM. Both the Chief Engineer and Director of OPM serve on the Research Advisory Committee (RAC), as discussed below.

2.3 RESEARCH ADVISORY COMMITTEE

2.3.1 Responsibilities

The RAC provides overall coordination of the GDOT R&D Program and sets priorities and policies to ensure that the most effective R&D program possible is carried out consistent with GDOT goals and objectives. RAC By-laws are found in GDOT Policies & Procedures Subject Number 5565-2. The Committee's general responsibilities are listed below.

1. Establish general, overall policies and procedures for the conduct of the R&D Program.
2. Review and recommend action on research priorities, needs, budgets, and administration; the Research Work Program; and other appropriate matters.
3. Stimulate and encourage GDOT personnel to use R&D projects to address GDOT needs and problems and to develop Research Needs Statements through the Research Technical Advisory Groups (RTAGs; see Section 2.4).
4. Encourage GDOT personnel to be involved in the conduct of R&D by participation in RTAGs and research projects.
5. Provide oversight for the RTAGs as necessary to guide the research. A RAC member is identified as a Liaison for each of the RTAGs. Each RTAG Chair and Vice-Chair will be encouraged to consult the RAC Liaison member for guidance in areas related to research needs.

2.3.2 Membership

The RAC has a membership composed primarily of GDOT Division Directors, but also includes the State Research Engineer and one representative from the FHWA Georgia Division office. The Committee is chaired by the Chief Engineer, with the Director of OPM serving as Vice-Chair. The SRE serves as the Secretary of the RAC and is responsible for arranging its regular meetings; providing materials for review, discussion and directive; and documenting all RAC actions. Each of the GDOT members may vote on proposed RAC actions, but the FHWA representative serves in a

non-voting, advisory role. Certain members of the RAC will serve as RAC Liaisons to each of the GDOT RTAGs (see Section 2.4).

2.4 RESEARCH TECHNICAL ADVISORY GROUPS

2.4.1 Responsibilities

The Research Technical Advisory Groups (RTAGs) are responsible for the development of needs statements for GDOT research projects, technical oversight of active research projects, and direct assistance with implementation of active and completed research projects. Each RTAG will provide RNSs and priorities to ensure that the most effective R&D program possible is conducted and implemented consistent with the strategic goals of the GDOT. The RTAGs also direct the conduct of Georgia's research in national programs like the TPF Program and help coordinate research procurement from Georgia universities and colleges. The RTAG Rules, including the general responsibilities of the RTAGs, are found in GDOT Policies & Procedures, Subject Number 5565-3.

2.4.2 Organization

The RTAGs are organized with the guidance and concurrence of the RAC. The RAC designates specific RTAG focus areas. The number of RTAGs is determined by the RAC in order to best serve the identification of research needs and development of research projects for GDOT. Each RTAG is anticipated to have cross-departmental representation from several Divisions and Offices.

Each designated RTAG identifies one of its members or appropriate GDOT staff as the Technical/Implementation (T/I) Manager for each specific research project. This T/I Manager is anticipated to be within the GDOT unit for which the project results

are anticipated to be implemented. The T/I Manager reports to the RTAGs on the implementation status of the research project during its conduct, as appropriate, and six months and one year after its completion.

2.4.3 Membership

The membership of an RTAG is based on recommendations from the RAC and from the management of Divisions and Offices. Each RTAG has a Chair and Vice-Chair determined by consensus from RTAG membership, and a Secretary is assigned to each RTAG from the R&D Branch. All GDOT members of the RTAG are equal voting members. GDOT Information Technology (IT) and FHWA members of an RTAG are non-voting, advisory members.

2.5 STATE RESEARCH ENGINEER

The State Research Engineer (SRE) is involved in the general supervision of the R&D function to help ensure that the goals and objectives of the R&D Program are attained. The SRE serves as secretary and is a voting member of the RAC, as well as being a representative to TRB and to the Research Advisory Committee of AASHTO's Standing Committee on Research (see Section 7.4).

2.6 RESEARCH & DEVELOPMENT BRANCH CHIEF

The R&D Branch Chief has direct technical and administrative responsibilities for managing the R&D Program. The R&D Branch Chief is responsible for managing the R&D Program in the following capacities:

- Planning, organizing, and directing the R&D Program

- Establishing R&D policies and procedures
 - Developing the annual Research Work Program
 - Directing the administration and operations of the R&D Branch
 - Negotiating and administering research contracts
 - Initiating research projects and activities
 - Maintaining an awareness of the state-of-the-art of transportation subjects
- Monitoring progress of research activities and expenditures
 - Serving as a liaison with FHWA, TRB, NCHRP, and other agencies, organizations, and individuals involved in research activities at the state and national level and acting as GDOT representative in matters not handled by the SRE
 - Disseminating the results of GDOT research, both internally and externally
 - Coordinating and reporting on implementation

2.7 OTHER DEPARTMENT MANAGEMENT

Since the R&D Program involves work in all areas of GDOT operations, GDOT office heads, their assistants, and other managers and units inside and outside of OR frequently interface with the program. This usually includes initiating research needs statements for proposed research, monitoring active research projects, participating

in the conduct of a project, assisting in implementation of research results, and providing input through the RTAGs.

2.8 PRINCIPAL INVESTIGATOR

Each research project, whether conducted in-house or by consultant, has a required Principal Investigator and/or Co-Principal Investigator who are directly responsible for the overall conduct of the project. They are responsible for conducting the project in accordance with the project proposal and ensuring that project objectives are met within time and budget limitations. They ensure that the project is properly documented through reports and other means in a manner that will facilitate implementation of results. For projects conducted in-house, the GDOT Principal Investigator may, but not necessarily, also be the T/I Manager (see Sections 2.4.2 and 2.10). For projects conducted by an academic institute or consultant, there is a separate GDOT T/I Manager.

2.9 RESEARCH PROJECT MANAGER

Each project, whether conducted in-house or by consultant, has an R&D staff member assigned to it as the research Project Manager (PM). The PM is the liaison between GDOT and the agency conducting the research. The PM handles administration of the project and contract, and provides GDOT input to the project, in conjunction with the T/I Manager (see Sections 2.4.2 and 2.10). The PM reviews the progress of the project, ensures that the proposal is being followed, handles invoices, resolves problems, ensures that objectives are met within budget and time limitations, processes reports for review and approval, and assists in implementation of project results.

2.10 TECHNICAL/IMPLEMENTATION MANAGER

Per Section 2.4.2, “Each designated RTAG shall identify one of its members or appropriate GDOT staff as the Technical/Implementation (T/I) Manager for each specific research project. The T/I Manager is anticipated to be within the GDOT unit for which the project results are anticipated to be implemented. The T/I Manager will report to the RTAGs on the implementation status of the research project during its conduct, as appropriate, and six months and one year after its completion.” The T/I Manager shares the project management responsibilities with the research PM by reviewing the technical progress of the project, addressing any technical issues or questions that arise, and reporting to the RTAGs on the implementation status of the research. The responsibilities of the T/I Manager are shown in Appendix 1.

SECTION 3.0

INITIATION AND EXECUTION OF RESEARCH PROJECTS

This section outlines the various procedures for initiating and executing research projects. R&D administration of national research activities is described in Section 7 of this manual.

3.1 INITIATION OF RESEARCH PROJECTS

3.1.1 Procedure

There are three typical steps for initiating a new research project.

1. Research needs statement development
2. Research proposal development
3. Contract execution

Each of these steps is covered in detail in the paragraphs below.

3.1.2 Research Needs Statement Development

3.1.2.1 Research Needs Statement Definition

A Research Needs Statement (RNS) is a statement of the need and justification for the research in a given area from the individual or office desiring the research. The RNS summarizes the research project and its significance. Guidelines for RNS preparation are found on the external R&D website at <http://www.dot.ga.gov/doingbusiness/research/Documents/needsguidelines.pdf> and in Appendix 2 of this manual.

3.1.2.2 *Classification of Research Needs Statements*

An RNS is classified as *internal* or *external*. If the submittal of an RNS is from within GDOT, it is internal. If the submittal is by an academic institution or other research entity, it is external.

- *Internal RNS.* Research may be initiated by anyone in GDOT, but most frequently originates with the RTAGs, Division Directors, Office heads, District Engineers, SRE, or R&D Branch Chief. It is required that GDOT management (Office head, District Engineer, or Division Director) support be confirmed before an internal RNS is submitted if it originates with their staff.
- *External RNS.* Research may be initiated by in-state academic institutions but not by out-of-state academic institutions, private consultants, or industry. A biennial GTI-UTC research workshop is a regular source of external RNSs targeted for conduct under the UTC, and is discussed in Section 3.1.2.4. FHWA may request that GDOT undertake and administer a particular research project on their behalf. For an external RNS, support from the appropriate GDOT office is required to be confirmed by R&D before or after the statement is submitted to R&D. R&D directs the RNS to the appropriate GDOT office for review and support. Meeting(s) among appropriate GDOT office(s), R&D, and the submitter may be arranged as needed to determine the content of the RNS. The RNS would be finalized with appropriate GDOT office input and support.

3.1.2.3 Review of Internal Research Needs Statements

Once an RNS is approved by the supporting GDOT office(s), it is submitted to the R&D Branch Chief for review and determination of a course of action. Based on the review and evaluation of the statement, and depending on the cost and scope of the project, the R&D Branch Chief will do one of the following with the RNS with concurrence of the SRE and the supporting GDOT office(s):

- Develop as a Special Research Study (SRS). SRE approval of the RNS is required to initiate this type of study, which has time urgency and a maximum \$75,000 cost.
- Submit to the RTAGs for approval as a Research Project, with other RNSs, at the regularly scheduled meeting. Where the total research funds needed for the RNSs exceeds the available funds, the RTAGs will prioritize the RNSs, with research having the highest need being funded first.
- Submit by electronic letter ballot to RTAG members for approval. This occurs when the submitting office requests urgent approval, the cost is greater than the limit set for an SRS, and the reviewers concur that the RNS is indeed urgent and requires approval before a scheduled RTAG meeting. The RNS is approved when a majority of RTAG members indicate their approval.

- Submit to one of the national research programs detailed in Section 7 for consideration if the RNS is national or multi-state in scope and if the RTAG concurs with the submittal.

3.1.2.4 Review of GTI-UTC Needs Statements

GTI-UTC research workshops are generally held biennially to identify UTC research needs statewide. One product of the UTC seminars is RNSs for consideration by GDOT. These statements are submitted to R&D for solicitation of appropriate GDOT office support and subsequent proposal preparation.

3.1.3 Research Project or Special Research Study Proposal

If the proposed RNS is approved by an RTAG as a Research Project or by the SRE as an SRS, the Principal Investigator is advised to develop a proposal for either of the above types of projects as described below.

If the project is to be done in-house, the R&D Branch and/or participating GDOT office(s) develop a proposal. If the project is to be conducted via contract with an academic institution, GDOT will notify the institution to proceed to proposal.

If a private consultant or out-of-state academic institution conducts the project, GDOT's Office of Transportation Services Procurement (OTSP) administers a Request for Qualifications (RFQ), which provides a general statement of the research problem to be studied and requests a non-costed statement of consultant or institution qualifications to engage in research to fulfill the RNS. The qualifications are evaluated under the general direction of OTSP and the R&D staff and other appropriate personnel in GDOT. The RFQ is based on OTSP protocol, and the consultant or out-of state academic institution develops the proposal.

3.1.3.1 Proposal Elements

The proposal contains extensive information about the research to be conducted. The proposal's required minimum contents, and those typically used, are given in the proposal guidelines. A proposal is prepared for each formal Research Project. The guidelines for preparing the Research Proposal are available on the external R&D website and are included in Appendix 3 of this manual. GDOT office(s), the R&D Branch, and the consultants or academic institutions review proposals and finalize the scope of work.

3.1.3.2 Preparation of Proposal for In-House Project

If the project is to be conducted in-house, the R&D staff prepares the proposal, or may assist in its preparation, working with the GDOT units that are involved in the project. Once the proposal is satisfactory to the GDOT support office(s) involved or, as applicable, the SRE, the project may proceed once funding is secured.

3.1.3.3 Preparation of Proposal by Research Consultant

If the project is to be conducted by a research consultant, either GTI-UTC staff or staff from the winner of the RFQ award prepare the proposal, working with GDOT R&D staff and the GDOT units that are involved in the project. Once the proposal is satisfactory to all GDOT units involved, the project may proceed to contract.

3.2 EXECUTION OF RESEARCH CONTRACTS

After approvals have been obtained to contract a Research Project, steps are taken to develop a contract mutually acceptable to GDOT and the research consultant. Two types of research contracts are typically used: cost reimbursement

(without fee) and cost plus fixed fee. Cost reimbursement contracts are most often used with non-profit organizations such as colleges and universities; cost plus fixed fee contracts are most often used with private consultants. Other types, such as firm fixed price, may be used under certain circumstances.

In addition to project-related clauses, these contracts contain provisions covering various Federal and State requirements such as those relating to Title VI of the Civil Rights Act of 1964, Drug Free Work Place, Lobbying, Debarment and Suspension, auditing of work and financial records, and eligible charges. These standard contracts have been approved by GDOT Legal Services and are used on a routine basis.

For research contracts with certain Georgia academic institutions, GDOT has developed standard contract language under unfunded Basic Ordering Agreements (BOA's) for research projects to facilitate their review and approval. This language is incorporated into the research contract by reference. Also, as discussed in Section 1.2, GDOT has a contract with GTI-UTC, under which multiple research subprojects may be conducted. Each of these subprojects is governed by the contract language, which allows project initiation based on approval of the proposal by the support GDOT office(s) and the SRE.

SECTION 4.0

PERFORMANCE OF RESEARCH PROJECTS

4.1 OVERVIEW

Various guidelines, policies, and procedures regulate the conduct of the R&D Program. This manual constitutes the primary collection of GDOT policies relating to research. Where appropriate, references have been made to other GDOT policies that may apply. In addition, FHWA policies and procedures regulate the R&D Program, since the majority of the Program's funding comes from FHWA. The major regulation guiding the R&D Program is 23 CFR Part 420 Subpart (A). This manual has been prepared in accordance with the contents of the CFR, Volume 5 of the FHWA Program Manual, and various other references. GDOT has been certified to operate under the SP&R Program Administration Final Rule published in the July 22, 1994 Federal Register, which grants greater flexibility in the administration of the Federal-aid R&D Program and permits certified R&D programs and state transportation departments to select and approve their own research projects.

4.2 MANAGING RESEARCH

Active research projects and activities are monitored under various activities. Involved in this monitoring are the following:

- *Research Technical Advisory Groups.* See Section 2.4.
- *State Research Engineer.* See Section 2.5.
- *R&D Branch Chief.* See Section 2.6.

- *Research Project Manager.* See Section 2.9.
- *Technical/Implementation Manager.* See Section 2.10.
- *Federal Highway Administration.* The research liaison from FHWA Georgia Division monitors all research conducted with Federal-aid highway funds. This includes participating in the GDOT RAC, RTAGs, project review meetings, reviewing progress reports, and other activities.

4.3 CONTRACT ADMINISTRATION

The overall administration and management of research contracts is the responsibility of the R&D Branch Chief. The Research Project Manager (PM) assists the Branch Chief in managing projects. PM's prepare contracts (and any modifications thereto), handle contract execution, monitor the research contractor's performance in relation to contract provisions, recommend payment of contractor's invoices, and verify all deliverables.

4.3.1 Changes in Work

4.3.1.1 General

During the course of a Research Project, it sometimes becomes necessary to make changes in the work or terminate the work entirely, which is explained further in Section 4.3.2. Typical changes may relate to cost, time, objectives, scope, or work plan. Proper proposal development minimizes the need for modifications. Research Project progress reports should identify circumstances that may require a contract modification.

4.3.1.2 Procedure

When major changes involving either cost or significant scope of work modification changes are necessary, the Principal Investigator or PM brings this to the attention of the R&D Branch Chief. Justification for the change is provided along with other required documentation, such as a modified work plan. After evaluation of the requested change by the supporting GDOT office, the SRE will approve or disapprove the change, based on this evaluation.

The R&D Branch prepares the appropriate research modification documentation. There are two types: (1) modified Task Order, for those organizations having a BOA; or (2) modification to contract. The modification is executed in the same manner as a research contract, with funding for the additional work being added via a GDOT Form 1625 (Project Allotment Funds Request) and FHWA work authorization. Copies of the modification are distributed to the contractor and within GDOT.

Time-only changes with no change in cost or significant scope of work modification can be performed by an exchange of letters or e-mails. The PM will ensure that time/schedule changes are justified.

4.3.2 Contract Termination

GDOT may terminate a research contract upon written notice to the contractor, for any reason, and the contractor is reimbursed for any work completed and other items, as addressed in the contract, up to the date of termination. Failure to meet the contract-required deliverables required for completion of an approved project may be considered just cause for termination of the contract. In the event of

termination, a summary report covering all work completed up to the date of termination will be submitted to GDOT.

4.3.3 Contract Completion

Final Report. A draft final report, as detailed Section 6, is sent to the PM and T/I Manager, and the report is reviewed by all appropriate GDOT parties. Following review, the PM sends a letter or email to the Principal Investigator, which contains GDOT review comments on the draft report. When the final report and a CD containing Microsoft Word and PDF versions of the report are received, the PM distributes the report to the standard recipients, including the GDOT Librarian, and ensures that the report is posted to the external R&D website.

Final Invoice. For information regarding final invoices, please see Appendix 4.

4.4 FINANCIAL MANAGEMENT

Federal and state funds provided for use in the R&D Program are managed by the R&D Branch Chief in accordance with the provisions stated in this manual. Expenditure of these funds are recorded, monitored, and reported to GDOT Office of Financial Management and FHWA and other agencies that provide funds. Contracts used in the R&D Program are also administered by the R&D Branch Chief, based on the federally-approved Research Work Program.

The procedures for the following actions are included in Appendix 4.

- Project entry into GDOT accounting system
- Invoice review and approval

- R&D budget report
- Contract modifications
- Project completion

4.5 EQUIPMENT MANAGEMENT

R&D research project property/equipment, as financed under the Federal-aid R&D Program, is managed in accordance with 49 CFR 18.32(b), which states the policies for the purchase and management of nonexpendable equipment, purchase or rental of equipment, disposal of nonexpendable equipment, inventory procedures, and patents and inventions.

4.5.1 Research Equipment/Property Inventory

This procedure outlines the process and documentation required for the inventory and control of equipment acquired with funds made available by research project contracts. Non-expendable equipment purchased with research funds must be inventoried and managed in accordance with relevant GDOT policies.

- ***Approval of Research Project Equipment.*** In a research proposal, Principal Investigators provide a list of non-expendable equipment to be purchased or manufactured during the research process.
- ***Inspection and Inventory.*** The PM confirms the project equipment inventory through the term of a research project. Any discrepancies or changes in utilization or need must be verified and reported to the PM by the Principal Investigator.

- ***Termination.*** Upon completion of the contract, or if the equipment is no longer needed for the research project, the PM determines disposition of the research equipment and obtains approval of the SRE, as discussed in the following section.

4.5.2 Research Equipment/Property Disposition

Any equipment purchased or manufactured as a part of a research project will be processed as follows at the completion of the project:

1. ***Final Inventory.*** The research contractor submits a final inventory list with the draft final report for the research project, as specified in the project contract. The PM compares the final inventory with the research contract and research contractor invoices to account for all items.
2. ***Final Inspection and Documentation.*** The PM arranges a final inspection of the research equipment inventory. The research contractor completes a Research Equipment Disposition Form to identify the equipment's quantity, original total cost, location, age, and fair market value. The form also identifies the condition and recommended disposition of all items.
3. ***Approval of Disposition.*** The SRE approves the disposition of all items on the Research Equipment Disposition Form.

SECTION 5.0

RESEARCH IMPLEMENTATION

All research activities are intended to solve a particular problem or provide useful information. It is the policy of GDOT to incorporate valid and appropriate research findings and new technology into its operations. R&D Projects contain work elements to ensure that GDOT implements research findings and new technologies. Consequently, each Research Project that is approved for conduct is approved with implementation of its findings as the project goal and within the official project objectives.

5.1 RESPONSIBILITIES AND FRAMEWORK

The responsibility for research implementation is a shared responsibility among the staff and units within GDOT, with varying roles to be performed by each. Successful implementation depends upon the cooperation, commitment, and support of all those involved.

5.1.1 Research and Development Branch

The R&D Branch Chief is responsible for managing and conducting the overall program and identifying appropriate implementation actions. The R&D staff PMs assist in tracking implementation actions.

5.1.2 Technical/Implementation Manager

T/I Managers report to the RTAGs on the implementation status of research projects during their project and six months and one year after its completion (see Appendix 1).

5.1.3 Research Technical Advisory Groups

The RTAGs are advised by R&D and the T/I Managers of research implementation activities (see Section 5.1.2).

5.1.4 Department Managers and Units

Each unit within GDOT, whether at the division, office, district, or other level, has a responsibility to continually review its operations and determine potential research needs with consideration of the benefits of implementing the research. Unit managers help ensure that implementation is paramount on proposed research projects and that it is considered and carried out on active and completed research projects. They assist in identifying and documenting the status of implementation and the benefits on completed research projects.

5.1.5 Principal Investigator

The Principal Investigator working on a particular research project is responsible for all implementation aspects throughout the conduct of the project and for presenting the findings in an Implementation Plan.

5.2 POST PROJECT ACTIONS AND ACTIVITIES

Numerous actions and activities are involved in the overall research project implementation effort and are employed as appropriate on both a routine and/or as-

needed basis through the cooperative efforts of the responsible participants. These include the following:

1. The Principal Investigator delivers an Implementation Plan, which documents the status of implementation on a completed GDOT research project, identifies any additional implementation efforts needed, and identifies steps for recommended efforts.
2. The R&D Branch distributes project summary flyers for completed GDOT research projects, which are prepared by the Principal Investigator (see Section 6.1.5).
3. The GDOT Library maintains a repository of research project reports. The most current reports are maintained on the R&D website, while older reports are posted to the Transportation Research International Documentation (TRID) website (see Section 9.3.2). Hardcopy versions are maintained in the Library as well. The library also maintains access to other libraries (see Section 9.2).
4. The R&D Branch publishes a newsletter to disseminate information on research projects and activities and contributes articles and news to GDOT's newsletter through the Division of Communications.
5. The R&D Branch submits an annual Research Implementation Report to the RAC summarizing how research findings have been implemented by GDOT during the preceding year (see Section 8.1).

6. The R&D Branch prepares recommended changes to policies, procedures, standards, and specifications. Any materials specifications or construction specifications developed through research will be developed into GDOT Specifications and, as appropriate, AASHTO specifications following the AASHTO Guide. AASHTO specifications can be presented to the AASHTO Subcommittee on Materials or the AASHTO Subcommittee on Construction by the appropriate GDOT office head.

SECTION 6.0

RESEARCH REPORTS

Reports are the primary means of documenting and disseminating the findings of research. In addition, they are usually the major instrument used in implementing research results. As such, they are an important part of the conduct of research and warrant proper expenditures of time and effort to complete in a successful manner. The various types of reports used in GDOT research projects are described in the following section.

6.1 TYPES AND DESCRIPTIONS

6.1.1 Quarterly Progress Reports

These reports are required for all GDOT research projects and are prepared by the Principal Investigator in accordance with the GDOT format (see Appendix 5). These reports present the progress on a project during the reporting period, planned work for the next report period, total expenditures for the current fiscal year and since start of project, any problems in conducting research, and a statement on implementing research results if appropriate. Reports are due to the R&D Branch within 15 days following the end of each reporting period, and they are distributed for information and comments to (1) appropriate GDOT personnel upon receipt; and (2) the RTAGs and FHWA quarterly via interactive website.

6.1.2 Interim or Phase Report

This report, as applicable, is formal in nature and covers a particular portion of project work. Normally the report is issued on lengthy projects or when it is desired

to disseminate project results as quickly as possible. Also, for multi-phase projects, such reports may be required before GDOT can approve subsequent phases of the project. Interim or phase reports may or may not be published. If they are published, they are approved per the guidelines for final report approval found in Section 6.2.

6.1.3 Technical Reports

Technical reports document work of a technical or complex nature which is significant to the project and which merits separate documentation from other reports. Technical reports may or may not be published. If they are published, they are approved per the guidelines for final report approval found in Section 6.2.

6.1.4 Special Reports

Special reports, as applicable, may result from informal research work, special research studies, or as an outcome of a unique aspect of a formal research project. In addition, special progress reports may be required for particular projects. These are informal reports desired for quick information purposes and which do not require review or approval. They are also not generally published.

6.1.5 Final Report

This formal report is the most important report relating to a particular project. It completely documents the entire research effort and should stand alone and provide a complete understanding of the project without detailed reference to other reports on the same project. The final report should discuss the problem being researched, project objectives and scope, procedures employed, findings, conclusions,

recommendations, implementation, and other items as appropriate. Guidelines for preparation can be found in Appendix 6 of this manual. A one-page flyer summarizing the project scope and benefits is required for submittal with the final report in research contracts.

The specific reports to be prepared for each project are indicated in the project proposal and contract (if a contract project), along with their due dates in draft and final form, the specified number of copies, and other related information. PMs for contract research projects also provide detailed information on reports to the Principal Investigator.

6.2 PROCEDURE FOR APPROVAL OF FINAL REPORTS

1. Each final report to be prepared for a particular project has a due date in both its draft and final form.
2. A report is first submitted to the PM in draft form for distribution for review and comments by GDOT. This draft should be complete in its contents and format, and stand as the final report should no changes be made. The draft is reviewed by appropriate personnel in GDOT and FHWA (as appropriate) or by another agency if applicable. This review includes:
 - A general technical review.
 - Consideration as to whether or not the organization, language, and content of the report are presented in a manner that will be intelligible to its intended audiences.

- An analysis of the conclusions and recommendations in relationship to the data and theories developed therein to determine whether the reviewer concurs that the author's conclusions and recommendations are supported by the data.
 - General editorial comments for the use of the author in preparing the manuscript for publication.
3. The review of the draft usually results in approval of the report with the appropriate incorporation of review comments into the final document. Written review comments and instructions are normally provided to Principal Investigators. In some cases, the review comments may be so extensive as to require that another draft be prepared and undergo another review before approval can be given.
 4. After a draft report has been approved, it is prepared in final form for printing and distribution.

6.3 DISTRIBUTION

Once reports have been printed, they are distributed by GDOT as follows:

- Hardcopies to GDOT personnel as appropriate, GDOT library, FHWA, and the University of Georgia library
- Electronic copies are posted to the external R&D website.
- Posting on the TRID web site, as detailed in Section 9.3.2.

6.4 PRESENTATION OF RESEARCH RESULTS IN PAPERS AND ARTICLES

6.4.1 General

Papers (articles, bulletins, and press releases) under an active project which contain significant technical findings previously undisclosed from a project should not be presented publicly or published without prior review by the GDOT. Modified provisions apply in unusual cases where time limits are short. Papers containing subject matter and technical findings substantially similar to that covered in a report which has been previously approved for publication do not require further review.

6.4.2 Procedure for Review

When it is desired that a paper be presented, the Principal Investigator should provide a copy of the paper appropriate GDOT personnel for review at least two weeks prior to the paper's due date.

SECTION 7.0

NATIONAL RESEARCH ACTIVITIES

In addition to conducting its own R&D Program, GDOT participates in various national research activities as described below. Under these activities, R&D resources are devoted to addressing national research problems as well as those specific to Georgia. Contributions to the Transportation Research Board, National Cooperative Highway Research Program, and Transportation Pooled Fund Program are approved each fiscal year under the R&D Work Program.

7.1 TRANSPORTATION RESEARCH BOARD

The Transportation Research Board (TRB) is an agency of the National Research Council, which is a division of the National Academies. The Board's purpose is to stimulate research concerning the nature and performance of transportation systems, to disseminate information that the research produces, and to encourage the application of appropriate research findings. GDOT contributes to the support of TRB annually through its R&D Work Program and utilizes all services provided by the Board, including a large publication program of research reports, special meetings and committee meetings, a large annual meeting to present and discuss research results, the TRID database of research publications, and other services. For further information concerning TRB, please see <http://www.trb.org>.

7.2 COOPERATIVE RESEARCH PROGRAMS

The Cooperative Research Programs are national contract research programs administered by the American Association of State Highway and Transportation

Officials (AASHTO), FHWA, and the National Academy of Sciences acting through TRB. These programs are directed at large-scale research projects which generally would apply to and be beneficial for all state transportation agencies. Each state DOT may submit problem statements for consideration, nominate members for project oversight panels, and become involved in monitoring active projects or participating in their conduct as a trial state to evaluate new procedures and techniques.

The primary Cooperative Research Program supported by GDOT is the National Cooperative Highway Research Program (NCHRP). GDOT, like the other 49 state DOT's, contributes to the support of NCHRP annually in the amount of 5.5% of its SP&R funds, and GDOT utilizes the results of this program extensively. NCHRP problem statements are due September 15 of each year.

Other Cooperative Research Programs are listed below. For further information concerning Cooperative Research Programs, please see the CRP web site at <http://www.trb.org/CRP/About/DivD.asp>.

- Transit Cooperative Research Program (TCRP)
- Airport Cooperative Research Program (ACRP)
- National Cooperative Freight Research Program (NCFRP)
- Hazardous Materials Cooperative Research Program (HMCRP)
- Surface Transportation Environmental and Planning (STEP) Cooperative Research Program (managed by FHWA rather than TRB)

Under the sponsorship of NCHRP, TCRP, and ACRP, TRB prepares syntheses of current practice in the highway, transit, and airport fields. These reports are an effective means of assembling and disseminating information on current practice. Each report is prepared by a consultant who has expertise in the topic area, with assistance provided by a technical panel. Practitioners and researchers make extensive use of these reports.

The first four of the Cooperative Research Programs above solicit for Synthesis topics. GDOT may submit topics for Synthesis studies and nominate employees for oversight panels. Forms for Synthesis topics are provided to GDOT executive management via email each year. GDOT staff may submit their topics themselves or through the R&D Branch.

As with the Cooperative Research Programs, states may nominate members for Synthesis project panels, which provide technical guidance and counsel throughout the life of the project. For further information concerning the Synthesis Programs, please see <http://www.trb.org/Studies/Synthesis/Syntheses.asp>.

7.3 TRANSPORTATION POOLED FUND PROGRAM

FHWA facilitates the management of the Transportation Pooled Fund (TPF) Program (<http://www.pooledfund.org>) as a means for interested states, FHWA, and other organizations to partner when significant or widespread interest is shown in solving transportation-related problems. Partners may pool funds, including SP&R funding, and when approved by FHWA, SP&R funds may be used without matching state funds. Activities may include research, planning, or technology transfer activities and may be jointly funded by several federal, state, regional, and local

transportation agencies, academic institutions, foundations, or private firms as a pooled fund study. GDOT participates in the funding of these projects on an individual basis when deemed beneficial.

A study must be proposed by a state or the FHWA to be included in the TPF Program. A TPF study typically has a sponsoring agency, a lead agency, and study partner(s). The sponsoring agency is the organization that formally proposes the study and solicits participation and funding contributions from study partners. The lead agency is the organization that contracts for the research and administers the study. The lead agency and sponsoring agency can be the same agency. A study partner is an organization that contributes funds or in-kind resources to the study.

7.3.1 Administrative Procedures for TPF Studies (National Level)

1. The lead agency submits the (1) problem statement; (2) request to establish a TPF study; and (3) request for use of 100% SP&R funding to the FHWA Division office in its state. The Division office submits the request to the TPF administrators at FHWA headquarters in Washington, D.C., along with its endorsement of the proposal. For FHWA-led studies, the problem statement and request are submitted to the TPF administrators directly.
2. Upon submitting the problem statement and request to establish the project, the sponsoring agency or lead agency posts the TPF solicitation on the website.
3. The TPF webmaster notifies the state agencies that the solicitation is being listed on the website.

4. Agencies interested in participating in the study indicate their funding commitments for the life of the study. Once the funding target has been met, the FHWA facilitator assigns a study number and clears the study to proceed. FHWA generally grants approval of 100% SP&R funds at the time it assigns the study number. The sponsoring organization withdraws the solicitation if the funding target has not been met or will not be met within the maximum one-year posting period.
5. FHWA or the lead agency advises the study partners that the study has been approved by FHWA and advises them to obligate funds for the study.
6. The lead agency issues and posts the request for proposals developed by the Technical Advisory Committee (TAC) for the FHWA-approved study.
7. A contract is awarded according to the lead agency's procedures.
8. The lead agency coordinates administrative activities for the study, convenes the TAC, and publishes and distributes study reports.
9. Upon completion of the study, FHWA determines if the financial records are complete and, if so, the study account is closed.
10. The study is closed formally with regard to funding. The FHWA Finance Division Reconciliation team directs the states to deobligate any remaining funds.

7.3.2 GDOT Procedures for TPF Solicitations

1. R&D receives a notification about a new TPF solicitation from the TPF administrators. Generally, the TPF webmaster notifies R&D of a new solicitation being posted on the TPF website.
2. R&D does a preliminary screening regarding the significance of the proposed study to GDOT. R&D consults the SRE in the preliminary screening as necessary.
3. The R&D-screened and selected solicitation is sent to the appropriate GDOT office(s) for review and advice on GDOT participation in the proposed study. The office(s) must specify a technical contact or contacts at this time.
4. If the reviewers recommend GDOT participation, R&D requests the approval of the RTAG officers (Chairs & Vice-Chairs). This approval is done quarterly via electronic ballot to each of the officers.
5. For each study approved by the RTAG officers, R&D then sends a commitment form to the TPF administrators via the TPF website, advising them of the GDOT funds contribution and contact details for the GDOT Technical Contact (TC) and Commitment Contact for the study. A TC provides guidance on technical matters in the study and is generally from the office recommending participation in the study; hence, the TC should have similar responsibilities as the T/I Manager. A research engineer from R&D remains the GDOT Commitment Contact for all TPF studies. R&D considers the study “Accepted” once the commitment form is sent.

6. R&D advises the TPF administrators of the studies for which GDOT declines participation. If the RTAG declines a study, the reason for not participating must be documented to prevent arbitrary declines.
7. For the accepted studies, R&D waits for the TPF administrators (lead state or FHWA) to notify them to obligate funds. Upon notification, R&D, with the help of the GDOT Office of Financial Management, obtains GDOT approval via Form 1625 and FHWA work authorization for obligation of funds. The obligation may be for the total funds contribution or for one fiscal year contribution, as applicable and determined by the R&D Branch Chief, for the study. The first obligation is made via work authorization, and the subsequent obligations are made via “modification.” While requesting the Form 1625 approval and work authorization/modification execution, it is important to mention the use of 100% federal SP&R funds with no state match. R&D considers the study fiscally active once the work authorization is executed.
8. R&D acts as an administrative contact for the TPF Program within GDOT and coordinates with the other agencies and GDOT offices as required.
9. Upon completion of the study, the TC and R&D receive a copy of the final report. R&D considers the study complete once the final report is received. A final report may be posted on the TPF web site as applicable.
10. R&D follows up with the TC and confirms the benefits of the study to GDOT offices.

7.3.3 TPF Studies with GDOT as a Lead State

For TPF studies with GDOT as the lead agency, the guidelines from the following website should be consulted: <http://www.pooledfund.org>.

7.4 AASHTO STANDING COMMITTEE ON RESEARCH AND RESEARCH ADVISORY COMMITTEE

The AASHTO Standing Committee on Research (SCOR) provides oversight to the transportation research community and develops research priorities for NCHRP. The Research Advisory Committee (RAC) to SCOR includes research managers from each state DOT and provides input on research needs and priorities. In addition, the AASHTO-RAC facilitates surveys that support research and provides a link between research managers. Both the SRE and the R&D staff actively participate in the AASHTO-RAC (Region II). For more information concerning SCOR and its RAC, please see <http://research.transportation.org>.

SECTION 8.0

RESEARCH PROGRAM REVIEW

The R&D Branch is responsible for managing the progress of GDOT research activities and evaluating the effectiveness of the GDOT R&D Program. The following reports and forums provide a summary of program performance. These include annual briefings to the RAC by the R&D Branch, Peer Exchanges, and Federal Review.

8.1 ANNUAL REPORTS

The RAC meets at least once per year, as stated in its By-laws. The R&D Branch provides an annual update on the R&D Program to the RAC each year. This update summarizes research expenditures over the past fiscal year, categories of research projects in progress, number of completed projects, and noteworthy active projects. It also includes formal submittal of a Research Implementation Report summarizing how research has been implemented by GDOT during the preceding year (see Section 5.2).

8.2 PEER EXCHANGE

Peer Exchanges are intended to help state transportation agencies identify and share successful research program policies and practices. State DOT's are required by FHWA to conduct periodic Peer Exchanges. The program is designed for representatives from research organizations to travel to the host agency to discuss and review its research, development, and technology transfer management process. Peer Exchanges are intended to benefit all participants through an open exchange of ideas, knowledge, and brainstorming.

At a minimum, the Peer Exchange team shall include two members of the AASHTO-RAC (see Section 7.4) who have previously participated in a Peer Exchange. State DOT's are encouraged to include a representative from FHWA. It is the state DOT's responsibility to initiate its Peer Exchange. The composition of the Peer Exchange team, the breadth of the issues covered, the duration of the exchange, and other issues are at the state DOT's discretion.

Guidance for conducting Peer Exchanges can be found on the FHWA website at <http://www.tfhr.gov/services/guidelines.htm>. Additional information can be found in 23 CFR 420.205 and the NCHRP Report *Guide for Developing a State Transportation Research Manual*.

8.3 FEDERAL REVIEW

The FHWA Division Administrator and the FHWA research liaison periodically review the GDOT R&D management process to determine if the state is in compliance with federal requirements for R&D. The Division Office also approves the *GDOT Research & Development Manual* and may conduct a compliance review. However, program compliance will normally be evaluated through routine involvement in the RAC and report reviews (23 CFR 420.117).

The FHWA Division Administrator and the FHWA research liaison also review and approve the annual Research Work Program. The Work Program is produced at the beginning of each federal fiscal year and provides a summary of administrative and project activities of the R&D Branch. The FHWA Division Administrator and the FHWA research liaison also review the annual Research Implementation Report presented to the RAC (see above).

8.4 PERFORMANCE MEASURES

The R&D Branch budgets research activities, the distribution of research across functional areas and research institutions, and the number of projects conducted. In keeping with national research objectives, future goals of the R&D Program are to document the value of research projects and the return on investment and to better document the implementation of research findings. The Research Implementation Report is used to capture these items.

SECTION 9.0

RESEARCH RESOURCES

Effective utilization of available knowledge is critical for the success of research activities. The information listed below provides resources covering ongoing and published research. These resources include the GDOT Research website, the GDOT Library, and the Research in Progress and Transportation Research International Documentation (TRID) databases.

9.1 GDOT RESEARCH WEBSITE

The GDOT Research website provides information on the following:

- On-line GDOT research reports
- Current research projects
- Research implementation
- Forms and guidelines

Site address: <http://www.dot.ga.gov/doingbusiness/research/Pages/default.aspx>

9.2 GDOT LIBRARY

The GDOT Library is a large collection of transportation-related information. The GDOT Library supports GDOT staff by finding information on various topics, developing search strategies, conducting literature searches, locating facts and statistics, identifying additional information sources, and obtaining articles and books through

inter-library borrowing. Portions of the collection that are particularly relevant to researchers include:

- GDOT publications, including research reports and project documents
- Transportation Research Board (TRB) publications
- Publications from other state DOT's, USDOT, and FHWA
- Online resources (permissions to access these sources vary; some may be accessed by librarians only, while others allow GDOT employee access or public access)

The GDOT Library Catalog is part of **Georgia Library Learning Online (GALILEO)**, a web-based virtual library serving the Georgia public (<http://www.galileo.usg.edu>). In addition, the GDOT Library networks with transportation libraries throughout the nation and may be able to access other relevant information.

9.3 ONLINE RESEARCH CITATION DATABASES

9.3.1 Research in Progress

The TRB Research in Progress (RiP) database (<http://rip.trb.org/>) contains over 8,000 records of current or recently completed transportation research projects. Each month approximately 100 new RiP projects are added to the database and another 150 RiP records are updated. Most of the RiP records are projects funded by federal and state Departments of Transportation. University transportation research is also included. In 1998, the Transportation Association of Canada began supplying records from its Canadian Surface Transportation Research Database for RiP.

International research projects from the International Transport Research Documentation (ITRD) database are now included in the RiP database as well.

The RiP database can be searched a number of ways, including by subject area, by organization conducting the research, and by persons involved in conducting the research. Current research projects can be submitted to the database, and subject-specific, monthly e-mails on new RiP records are available by subscription.

9.3.2 Transportation Research International Documentation

The Transportation Research International Documentation (TRID) database (<http://trid.trb.org/>) is the world's largest and most comprehensive bibliographic resource on transportation information, containing 940,000 records of published transportation research, as of 2012. Abstracts and citations are standard, and many records contain either HTML or PDF links. TRID is produced and maintained by TRB at the National Academy of Sciences. This resource provides an important first step in understanding the current baseline of events and recent innovations.

The GDOT Librarian is typically contacted for assistance with any database or information access issue. The Librarian can be reached via phone at 404.608.4800.

APPENDICES

Appendix 1: Responsibilities of Technical/Implementation Manager

Appendix 2: Research Needs Statement Guidelines

Appendix 3: Research Proposal Guidelines

Appendix 4: Fiscal Administration of Research Projects

Appendix 5: Quarterly Progress Report Example

Appendix 6: Final Report Guidelines

APPENDIX 1

RESPONSIBILITIES OF TECHNICAL/IMPLEMENTATION MANAGERS

RESPONSIBILITIES OF TECHNICAL/IMPLEMENTATION MANAGERS

Introduction

Per GDOT Policy 5565-3, Rules for the Research Technical Advisory Groups (Article II, Section I), “a designated RTAG shall identify one of its members or appropriate GDOT staff as the Technical/Implementation Manager for each specific research project. This Technical/Implementation (T/I) Manager is anticipated to be within the GDOT unit for which the project results are being implemented.” The T/I Manager, by title, serves as the leader in (1) technical direction for a research project; (2) development of an implementation plan during a research project; and (3) continuing implementation after the research project is ended. This appendix summarizes the responsibilities of T/I Managers for research projects approved for conduct by the Research Technical Advisory Groups (RTAGs) from T/I Manager identification through project implementation.

T/I Manager Identification

GDOT offices periodically submit Research Needs Statements (RNSs) to the RTAGs for approval for conduct as research projects. RNSs may also be developed within the RTAGs themselves for approval. Each RNS includes the intended T/I Manager for the project, as provided by the office(s) submitting the RNS or as named by the RTAG preparing the RNS of its own approval. The intended T/I Manager may be involved in development of the RNS, as appropriate. Once an RNS is approved for conduct by any of the standing RTAGs, the T/I Manager is confirmed by the office(s) submitting the RNS.

Research Proposal Development

Once identified, the T/I Manager is advised of their responsibilities by the Research and Development (R&D) Branch of the Office of Research (OR). The Secretary of the RTAG approving the RNS, who is a member of the R&D Branch, provides the T/I Manager with a copy of the RNS and the literature review done as part of the RNS. T/I Manager responsibilities during proposal development are shown below, according to the type of research contract.

University contracts

- Attend pre-proposal meetings to help develop the following proposal elements: (1) scope of work; (2) required deliverables; (3) support provided by GDOT; and (4) implementation goals. Where there are multiple candidate proposals, the T/I Manager helps review the proposals and make final selection of the proposal for the research project.
- Serve as the primary resource person for technical questions which may arise during proposal preparation. Multiple pre-proposal meetings may be needed to finalize the proposal, and the T/I Manager is expected to attend these meetings or may recommend other GDOT staff to attend them.
- Review draft research proposals and provide comments on them.

General solicitation contracts

- Attend internal GDOT meeting(s) to develop the scope of work for Request for Qualifications or Request for Proposal.

- Serve on the selection committee for procurement of research services through the Office of Transportation Services Procurement (OTSP) and participate in interviews of candidate consultants.
- Assist with development of final scope of work following consultant selection.

During proposal development, the T/I Manager helps identify, as much as possible (1) the overall project scope, deliverables, and implementation goals; (2) roles and resources for successful implementation of the research; and (3) any necessary stages for the implementation.

Research Contracting Process

Contracting administration for research contracts is handled by either the R&D Branch (university contracts) or OTSP (general solicitation contracts). The T/I Manager is not expected to assist with the research contract process.

Project Kickoff Meeting

The T/I Manager attends the project kickoff meeting, which is arranged and conducted by the Research Project Manager (PM). The PM, with assistance from the T/I Manager, identifies and invites other key people from within and outside GDOT who should attend this meeting. Discussion at this meeting includes the scope of work and implementation. The T/I Manager is expected to confirm GDOT support needed for implementation at this meeting, in follow up to the implementation planning done during proposal development. An implementation plan is to be fully developed during the course of the project with direction and assistance from the T/I Manager.

Research Project Management

During the research project, the T/I Manager's responsibilities include the following:

- Serve as technical consultant
- Review quarterly progress reports
- Review interim technical or milestone reports
- Attend project meetings, including any construction-related meetings pertaining to the research, as needed
- Visit research field and/or laboratory testing, as needed
- Review proposed changes to project scope, budget, and/or schedule
- Review the draft final report and provide comments to PM
- Attend project wrap-up meeting to discuss findings and implementation plan
- Attend trainings, workshops, or seminars at end of project or afterward, as needed, to disseminate and implement project findings

The T/I Manager is not expected to assist with administrative items such as invoices, contractual changes, or fiscal closeout. If the T/I Manager has any concerns related to the research progress, these concerns should be discussed with the RP Manager.

Implementation Reporting to RTAGs

The T/I Manager is expected to report to the RTAGs on the implementation status of the research project during its conduct and six months and one year after its completion.

APPENDIX 2

RESEARCH NEEDS STATEMENT GUIDELINES

GUIDELINES FOR PREPARING RESEARCH NEEDS STATEMENTS

(<http://www.dot.ga.gov/doingbusiness/research/Documents/needsguidelines.pdf>)

A research needs statement provides a brief summary of the proposed research. The preferred length of a research needs statement is up to two pages; however, a length of up to three pages is permissible as needed.

A research needs statement covers the following:

Title	Provide a short, descriptive title.
Problem Statement	Provide a concise description of the proposed research project including a statement of the problem to be solved or the research need.
Literature Search	Submitters are required to do a literature search before submittal to avoid duplication with current or past research. Searches should include review of the TRID (http://trid.trb.org/) and Research in Progress (http://rip.trb.org/search) databases.
Research Objective	A statement of the specific research objective, defined in terms of the expected final product, which relates to the general problem statement above. Define specific tasks as necessary to achieve the objective and methods of investigation.
Research Significance	Provide an explicit statement of the final product of the research and how it is to be used by GDOT at the close of the project. Discuss the direct benefit to GDOT from the proposed project and its implementation. Include a benefit/cost ratio of implementing the project findings and/or deliverables. Discussion may be expanded for multiple objectives and deliverables. The benefit should be quantified in dollars, and include a general explanation of how it was derived. The cost would be the total project cost not including implementation costs outside of the project.
Project Duration	Indicate the proposed duration of the project.
Cost Estimate	Provide an estimate of the total cost of the project.

Statement Developer(s)	Provide the name(s), phone number, e-mail address, and contact information for the person(s) developing the statement.
Investigator(s)	Provide the name(s) and contact information of the proposed Project Director.
Agency	Provide the name of the agency/institution proposing the research.
Date of Submittal	Provide date that the needs statement is submitted to GDOT.
GDOT Office(s) Supporting	Provide, as possible at time of submittal, name(s) of the GDOT office(s) supporting the proposed research. This contact office, if not known at the time of submittal, should be noted as "TBA."
Technical/Implementation Manager	Provide, as possible at time of submittal, name of the GDOT staff member who is responsible for technical-implementation management of the proposed research. This contact, if not known at time of submittal, should be noted as "TBA."
References	References should be included at the end of the document.

APPENDIX 3

RESEARCH PROPOSAL GUIDELINES

GEORGIA DEPARTMENT OF TRANSPORTATION
OFFICE OF RESEARCH
RESEARCH AND DEVELOPMENT BRANCH

GUIDELINES FOR PREPARATION OF RESEARCH PROPOSALS

A. Proposal Format

Cover Page

The cover page shows the Organization, herein referred to as “research agency”, proposing the research, complete address, Title of Project, Project Director(s), phone numbers, estimated cost, and estimated time to conduct.

Introduction

A clear description of the problem including any additional information needed to understand the problem.

Objectives

A clear and concise statement for the specific research objective(s). The objective is typically the reason for conducting the project and/or the expected final outcome or product.

Work Plan

How the work will be done typically under identified tasks, and the individual tasks’ objectives that are to be accomplished. Meetings with GDOT will be identified in the Work Plan at appropriate milestones. At GDOT’s discretion, a quarterly or special report may be accepted in lieu of a milestone meeting.

Significance of Research

Significance of the research and benefits to the Department that are expected.

Deliverables

All specific deliverables shall be listed under a heading within the proposal generally before the Schedule and Budget, and related to the work plan’s principal activities. Dates for deliverables shall be included and related, not by calendar date, but in terms of months (half-month increments, as needed) within the total project schedule or as related to a specific work activity milestone, e.g. start or completion. A Draft and Final Report must be included as a deliverable. Any systems and/or interim reports or special milestone reports, as applicable, should be noted as deliverables. A project information

flyer, single page and in GDOT format to be provided, must also be included as a deliverable.

Implementation

A section on how the results will be put into practice should be included. As applicable an outline implementation plan will be provided for post-project use.

Budget Estimate

The estimated total project cost must be included in the proposal and itemized on budget sheet. The project budget should be itemized in accordance with the following budget categories, as appropriate. Other categories may be added, if necessary.

1. Salaries and Wages: Percentage of time and actual salary rate per hour, month, or year for each employee directly involved on the subject project.
2. Fringe Benefits: Cost and rate percentage for applicable staff working on the subject project.
3. Equipment:
 - A. Purchase - all items with a value of \$5,000.00 or more required for the conduct of research.
 - B. Rental - all major items and rental rate.
4. Materials and Supplies: Materials, supplies, and other miscellaneous items not covered elsewhere in budget.
5. Travel Expense: Transportation costs plus reasonable actual subsistence expenses (or an allowance in lieu of actual subsistence costs) of persons working directly on the subject project. Any expected out of state or country travel should be identified and included.
6. Subcontracts: Name and cost of all subcontracts, as applicable, shall be shown individually and as single sum.
7. Overhead: The official overhead and shown rate, as determined in accordance within the research agency

The estimated total project cost shall be represented by separate budget estimate sheets also itemized for each specific work plan activity or major task. The sums of the partial costs and itemizations of the individual task budget sheet amounts shall match the total project cost and itemization budget sheet.

Work Plan Schedule

A detailed work plan schedule showing the principle activities, milestone meetings, and time schedule must be included. Months should be represented by numbers and not calendar names.

Support Required from GDOT

If any assistance such as data, equipment, or personnel will be needed or desired from GDOT, describe in detail the GDOT work or support element.

B. Submission

The proposal should be submitted electronically or by hard copy to the appropriate GDOT Office head with copy to:

David M. Jared, P.E.
Georgia Department of Transportation
Office of Research
15 Kennedy Drive
Forest Park, Georgia 30297-2534
djared@dot.ga.gov

GDOT may elect to require changes to the submitted proposal.

APPENDIX 4

FISCAL ADMINISTRATION OF RESEARCH PROJECTS

FISCAL ADMINISTRATION OF RESEARCH PROJECTS

As stated in Section 4.4 of this manual (Financial Management), “Federal and state funds provided for use in the R&D Program are managed by the Chief of the R&D Branch in accordance with the provisions stated in this manual. Expenditure of these funds are recorded, monitored, and reported to appropriate GDOT personnel and FHWA and other agencies that may provide funds. Contracts used in the R&D Program are also administered by the Chief of the R&D Branch, based on the federally approved Research Work Program.” Also per Section 4.4, fiscal administration of projects includes project entry into the GDOT accounting system, invoice review and approval, R&D budget report, contract modifications, and project completion. Summaries of these procedures are provided below.

1. *Project Entry into GDOT Accounting System.* The GDOT Project Identification (PI) Number is entered into the GDOT accounting system by the GDOT Office of Financial Management (OFM) during contract execution. The separate GDOT Research Project Number (an in-house catalogue number) is entered in a log of research projects, and an active projects list, maintained by the R&D Branch. A copy of the research contract is provided to the Office of Materials Administrative Branch Chief, who prepares invoice vouchers after invoices are reviewed by R&D staff for routing to GDOT General Accounting for processing and payment. The Administrative Branch Chief maintains a file for each Research Project and monitors and keeps copies of all invoices paid for each project.

2. *Invoice Review and Approval.* Project invoices are sent to the Research Project Manager (PM) in the R&D staff for review and approval of payment. The PM is responsible for ensuring that the items on the invoices are authorized expenditures based on the research project contract and within approved annual budget levels for the project. The PM notifies the consultant and the Administrative Branch Chief if any discrepancies exist on the invoice, and the PM and consultant resolve any discrepancies. The PM approves payment for the invoice and forwards it to the Administrative Branch Chief at OM for processing via a routing voucher sheet. The invoice is normally signed by the SRE or, in the SRE’s absence, by the SRE’s assistant. The Administrative Branch Chief then submits the signed invoice to GDOT General Accounting for payment.

3. *R&D Budget Report.* The R&D Branch maintains a budget report recording the total SP&R Research funds available to the R&D Branch, based on the total costs of all R&D activities and also tracks pending encumbrances from research projects not yet active.

4. *Contract Modifications.* If a project requires additional funds or a time-only extension, a copy of the fully executed contract modification or time-only extension approval is sent to the Administrative Branch Chief, to GDOT General Accounting (Contracts Payable Unit), and to OFM.

5. *Project Completion.* When the final invoice from the research organization is received and reviewed by the PM and the Administrative Branch Chief, it is forwarded to GDOT General Accounting for final payment, along with a request for final audit. The final invoice will be paid by GDOT per GDOT policy and is not pending any final audit. Payment of the final invoice marks the completion of the project and the termination of the contract. Any findings of the final audit are handled outside the project schedule.

APPENDIX 5

QUARTERLY PROGRESS REPORT EXAMPLE

RESEARCH PROGRESS REPORT DEPARTMENT OF TRANSPORTATION STATE OF GEORGIA		Report No. 4	Date: 6/28/07
		Report Period From: 3/31/07 To: 6/30/07	
Project No. 04-04	Project Title: Estimating Critical Shear Stress of Bed Sediment for Improved Prediction of Bridge Contraction Scour in Georgia		
Research Agency (s): Georgia Transportation Institute		Project Director (s): Terry W. Sturm, Principal Investigator	
Starting Date: 7/01/2006	Completion Date: 9/01/2008	Total Months: 26	Time Expended Months = 12 Percent = 46
Funding Source (s): SP&R, Research.		Funds Authorized: \$170,085	Funds Expended Rept. Period Total \$28,000 \$75,000
<p><u>Objectives / Tasks:</u></p> <p>Previous GDOT research by the principal investigator has resulted in an approximate method for estimating critical shear stress for initiation of motion of river bed sediment to be used in bridge pier scour prediction methods applied to Georgia bridges. A related research need is to improve bridge contraction scour estimation, which depends not only on characterizing critical shear stress properties of the sediment but also on predicting the flow field and its interaction with the bed sediment as a result of the flow contraction caused by the bridge opening. Contraction scour was the dominant failure mechanism for some 125 bridges that had to be replaced in Georgia after Tropical Storm Alberto in 1994. The objective of the present research is to improve the predictive relationship for critical shear stress in terms of easily measured sediment properties so that it can be utilized in a proposed contraction scour formula that is more realistic than the current one, which is based on idealized flow conditions. The following tasks will be performed:</p> <ol style="list-style-type: none"> (1) Reconfigure the bathymetry of the existing Ocmulgee River model in the CEE Hydraulics Laboratory with a smaller sediment size to compare measured contraction scour with previous results for a larger sediment size. This task will guide the selection of sediment size for the model to be built in task 2. (2) Build a physical model of a relatively small bridge site for which contraction scour is the primary scour mechanism and study it in the CEE Hydraulics Laboratory. The site will be chosen in cooperation with GDOT personnel from among bridges for which field data are available relative to scour failure during Tropical Storm Alberto. (3) Measure the critical shear stress in the Georgia Tech erosion flume of 10 Shelby tube samples taken by GDOT personnel at 5 bridge sites strategically located with respect to the physiographic regions of Georgia and measure additional properties of the fine-grained sediment fraction of the samples using a rheometer. (Continued) (4) Develop an improved contraction scour prediction formula that takes into account critical 			

shear stress estimated from relatively simple soil tests.

Status:

Task 1 is completed.

Task 2 is approximately 15% completed.

Task 3 has just begun with arrival of first samples.

Task 4 is approximately 20% completed.

Progress This Reporting Period:

A second experimental run of the Ocmulgee River model with 9 tons of new sand having a median sieve diameter of 0.53 mm was completed. This run was conducted for an incipient live-bed scour velocity ratio of 0.93 in contrast to the previous run with a value of 1.0. Final data analysis has been completed. This completes the studies on the Ocmulgee River model.

Four candidate bridge sites for laboratory modeling were visited in the field and USGS flow data, topographic data, photos, and aerial photographs were analyzed. The results of the field reconnaissance were presented in a meeting to Paul Liles, Susan Beck, and Sam Teal of the OBD. The Tobesofkee Creek site was considered the best possibility of those visited, but the OBD wanted to review additional sites. Six additional sites were identified for reconnaissance and will be visited in July.

Three soil cores were received from Chris Adams and the erosion testing program is underway.

Work planned for the next report period:

Additional candidate bridge sites will be visited and a final site will be selected. Field data will be collected for the bridge that is selected for modeling, and a preliminary model design will be completed based on the Ocmulgee River tests. Demolition of the Ocmulgee River model is expected to be completed, and construction of the new bridge model should be underway. Testing of soil cores for critical shear stress will continue.

Findings:

Preliminary results from the two Ocmulgee contraction scour tests indicate that contraction-scour models should be built for Froude number similitude at the condition of maximum clear-water scour with the model sediment size chosen accordingly. This requires careful selection of the model scale and the sediment size.

Anticipated Problems/Course of Action:

No problems anticipated as of now.

Submitted By

Terry W. Sturm

Project Director

APPENDIX 6

FINAL REPORT GUIDELINES



Guidelines for Preparation of Research Project Reports

Georgia Department of Transportation

Office of Research

Research and Development Branch

September 2012

Guidelines for Preparation of Research Project Reports

Purpose

These guidelines are for the preparation of Research and Development (R&D) project reports which are prepared by or for the Georgia Department of Transportation (GDOT). The information contained herein is provided to produce some degree of uniformity in R&D reports and to ensure that applicable GDOT and Federal Highway Administration (FHWA) regulations are followed. This guide will help to promote a more efficient procedure in administering R&D project reports.

The guide consists of two parts. The first part contains general information, and the second part details the format and elements of reports. Progress reports are also required for each research project, but information on these reports is contained in the *Georgia DOT Research and Development Manual* or on the Georgia Transportation Institute-University Transportation Center (GTI-UTC) website at <http://www.gti.gatech.edu>. Any questions on reports should be directed to the R&D Branch.

Part I – General Information

A. Need for reports

All R&D projects require the preparation, submission, review, and approval of appropriate written reports to document the project's objectives, activities, findings, conclusions, and recommendations and to permit other appropriate persons to understand, evaluate, and duplicate the research project.

B. Type of reports

Reports may be interim, technical, or special in nature, but in any case a final report must be prepared for each project. The type of report to be prepared for each project, along with the due dates, are outlined and discussed in the research project proposal. Please see the *Georgia DOT Research and Development Manual* (Appendix 5) or the GTI-UTC website for R&D proposal guidelines.

- *Interim or Phase.* An interim report or reports may be required for a long-term project to report on various work phases as they are completed, thus allowing a prompt dissemination and implementation of project results.
- *Technical.* Technical reports document work of a technical or complex nature which is significant to the project and which merits separate documentation from other reports.

- *Special.* Special reports may result from informal research work, special research projects, or as an outcome of a unique aspect of a formal research project. In addition, special progress reports may be required for particular projects. These are informal reports desired for quick information purposes and which do not require review or approval. They are also not generally published.
- *Final.* A final report is required for all projects and should cover activities of the entire project from beginning to end. It should incorporate appropriate data and information from other reports prepared for the project and should be able to stand alone as documentation of all project work.

C. Composition and style of writing

The report should be clear, complete, concise, and written in an understandable style. This is especially important, since many people reading the report may not be familiar with the subject matter or its technical aspects. Aim at providing a report which can be understood and used by all those who may be concerned with its subject.

An introduction should be included in each report to introduce and explain the research project itself and the scope of the report to the reader. A good background statement is important in producing understanding. Tables and figures should be used whenever possible, as they help to present clear and concise information in a summary form, thus eliminating the necessity for lengthy description and explanation in the text. In addition, they make the report more usable in an operational situation and assist in implementing project results. Photographs are helpful for the same reasons and should be used when applicable.

All technical aspects, terms, etc., should be thoroughly explained for the unfamiliar reader. Where lengthy data or information in tables, figures, or text exists, consider placing this information in an appendix to avoid cluttering the text and disrupting the continuity of the report.

Above all, aim at producing a readable report. If project reports are not read, the effectiveness and success of the project itself is greatly reduced.

D. Report submittal, review, approval, printing, and distribution

1. *Submittal.* All reports which are to be published (excluding progress reports) are first prepared in draft form and are submitted in the required number of copies (usually 10, but reference project proposal and/or contract for the exact number) to the R&D Branch for review, comments, and approval by appropriate personnel within GDOT and FHWA, if federal funds are involved. This draft should be reproduced by photocopying or similar means and should be bound with staples or other appropriate binding. The draft should be in a completed form having all the elements of a report.

2. *Review.* The review process normally takes one to two months to complete, depending upon the particular project. Upon completion of this review, comments are returned in writing to the researcher for consideration and incorporation into the final report document.
3. *Approval.* Approval of the report and acceptance for publication are usually also given in an email or letter transmitting review comments to the researcher, but in some cases a second review may be necessary before approval is given. Upon approval of the report and necessary revisions, the report should be prepared for printing as outlined below.
4. *Printing.* The project contract indicates the printing responsibilities, procedures, and number of report copies required for each project. The researcher should provide the R&D Branch with a camera-ready copy of the report with all the text, figures, tables, photographs, etc. being originals, and with a CD-ROM containing two files: (1) the entire report in a single Word file; and (2) the entire report in a single PDF file. Information is given in other parts of this guide on expected content of the camera-ready copy. The report should be assembled ready for printing with no further work required by the R&D Branch. Upon completion of printing, the report original and CD-ROM will be maintained in the files of the Office of Research.
5. *Distribution.* After printing is complete, the R&D Branch distributes the report to appropriate personnel within and outside GDOT.

Part II – Format and Elements of Report

This section provides guidance relating to the report format and various elements of the report. Any items not covered are left to the discretion of the writer or a R&D branch staff member should be contacted for guidance or a reference can be consulted such as *A Manual for Writers of Term Papers, Theses, and Dissertations* by Kate L. Turabian. References are made in the following attached exhibits to illustrate the various items where appropriate.

A. General Elements

1. *Paper.* The paper should be white and 8-1/2 by 11 inches in size. Oversize pages which require folding should be avoided if possible, since they create printing problems. If information cannot be presented legibly on the 8-1/2 x 11 format, consider preparing it on a larger, proportional size format and then reducing to 8-1/2 x 11. Also, since most reports are printed on both sides of a page, use can be made of the two page format by, for example, splitting a figure in the middle and putting part of it on the left page and part on the right page.
2. *Spacing.* All reports should be typed double-spaced.

3. *Margins.* For all pages in the report, margins should be at least 1-¼ inches on each side and 1 inch at the top and bottom, including pages that contain tables, figures, etc. Side margins are particularly important, since printing is usually done using both sides of a page. If adequate margins are not available, the printed material may extend into the binding area.
4. *Page numbers.* All pages in both drafts and final revised versions should be numbered. Pages in the preliminaries or front matter of the report should be numbered with small Roman numerals (i, ii, etc.) at the bottom center of each page. Begin numbering the pages of the remaining portion of the report with the Introduction (or first major heading in the body of the report) and number in the bottom center of the page with Arabic numerals (1, 2, etc.). The page number is usually omitted on the very first page. In numbering the pages themselves, the following guidelines should be followed:
 - a. Draft – Each page should be numbered consecutively following the above rules. All reproduction by photocopying or similar means is done on only one side of a page.
 - b. Final Revised Version – To produce a concise report, reports are sometimes printed using both sides of a page. The writer should consider this printing procedure when preparing the final version of the report (after considering and incorporating all comments from GDOT and FHWA as applicable), which will constitute the “camera-ready” copy that will be used in printing. The foregoing general guide covered in item #4 above should be followed with the addition of the following: (1) all major headings such as the preliminaries or front matter (abstracts, table of contents, list of tables, etc.), chapters, appendices, etc., should begin on the right-hand page, and (2) all right-hand pages should be odd-numbered, and all left-hand pages should be even-numbered (printing tradition). All pages should be numbered in this manner when the camera-ready copy is transmitted to the R&D Branch, so that it can be printed with no further revision. In most cases, it will be necessary to renumber the pages (from those in the draft) and make changes in the table of contents, etc. for two-sided printing.
5. *Tables and Charts.* Tables and charts should be used as needed and should be listed in a list of tables with the table number, the title exactly as shown on the table itself, and the page number. The table number and title are usually placed at the top of the table (see Exhibit A). Each table should be discussed in the text and should appear on the same page or the next page after being mentioned in the text. Table numbers should be consecutive throughout the report. Margins should be the same as on a regular text page (a minimum of 1 ¼ inches on side, 1 inch at top and bottom). If numerous tables are to be presented, consider placing them in an appendix to avoid cluttering the text and perhaps interfering with the reader’s train of thought. If the table must be placed on a page lengthwise, it should be oriented to be read from the right of the report, as shown in Exhibit B.

6. *Figures.* Figures, including photographs, should be used as needed, in accordance with the same guidelines given for Tables and Charts in item #5 above. Figure numbers and titles are placed under the figure. Photographs are useful in reports and should be used whenever appropriate. See Exhibit C.
7. *Covers.* A standardized report cover for Department R&D reports will be provided to the writer upon request, or the writer may choose to use a different cover. In either case, the information contained on the cover, as shown in Exhibit D, must be on the cover.

A. *Format and Contents*

The format and outline of the contents for each report is generally as follows and in the order presented below.

1. *Preliminaries (Front Matter)*
 - a. Inside title page – The inside title page gives appropriate identification of the project and report and is the first page inside the cover. The content of this page varies slightly, depending on whether the project is conducted “in-house” (see Exhibit E) or by contract (see Exhibit F).
 - b. Technical Report Standard Title Page – Each project report should include this Title Page, which is standard for all FHWA-sponsored projects, immediately after the inside title page and preceding the Table of Contents. The Technical Report Standard Title Page includes an abstract of 250 words or less which describes the study in general, including objectives, procedures, and significant findings based on project work. See Exhibit G for an example. A list of key words should be included at the bottom of the Title Page which best describes the report subject matter. The Title Page does not need to be listed in the Table of Contents.
 - c. Table of Contents – A table of contents should be included containing preliminaries (front matter), major divisions of the report, appendices, and references. See Exhibit H.
 - d. List of Tables – See Exhibit I.
 - e. List of Figures – See Exhibit J.
 - f. Executive Summary – An executive summary should be included that summarizes the project objectives, procedures, significant findings, and recommendations for implementation. Suggested length of the executive summary is approximately 1000 words.
 - g. Acknowledgements – This section is optional and is provided to acknowledge the various types of assistance which the researcher has received during the course of the project.
 - h. Other – Other elements may be added as needed.

2. Body of Report
 - a. Introduction – Include an introduction to explain the project in general and include brief statements on the background of project, reason for being conducted, objectives, scope, significance, and anticipated results and implementation aspects.
 - b. Divisions – Following the introduction, the report should be divided into logical divisions depending on the subject matter and should contain information on the study procedure employed, findings, conclusions, and recommendations (including suggested implementation), although the chapters of headings need not bear these exact titles.
 - c. List of references or bibliography – An appropriate listing should be given for publications suggested for reference and/or consulted during the course of the project. See Exhibit K.
 - d. Appendices – Include in the appendices any material which is not appropriate for inclusion in the text due to length, technical nature, etc. See Exhibit L for titling guide.

EXHIBIT A

TABLE 1
Title of Table

Notes:

(1) Type table number and title at top of page.

(2) Maintain minimum margins of 1-¼ inch on sides and 1 inch at top and bottom.

EXHIBIT B

TABLE 2
Title of Table

Note: When tables (or figures) are oriented lengthwise on paper, always prepare so as to be read from the right side, as shown here.

EXHIBIT C

Street Intersection Density in Atlanta Metropolitan Region

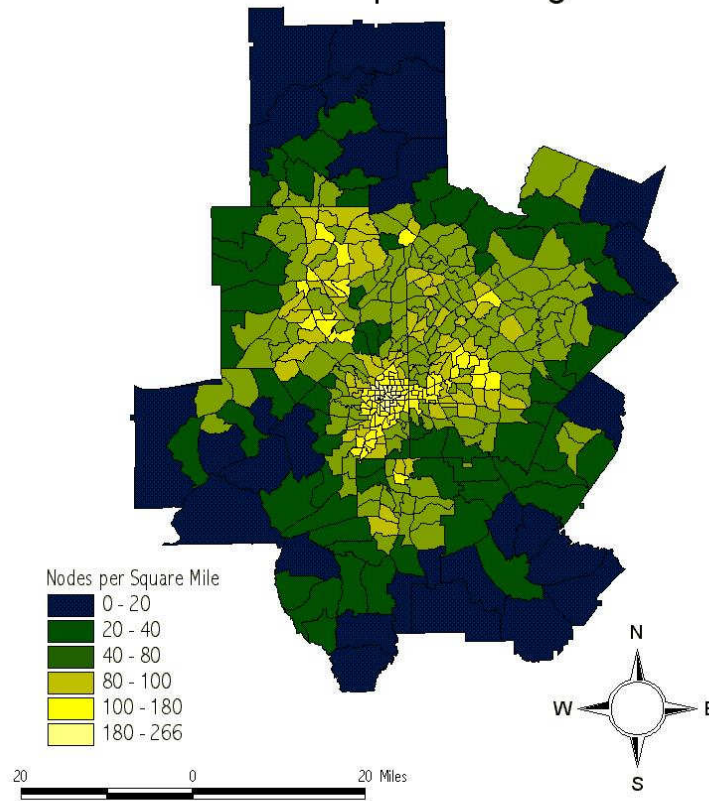


FIGURE 1

Title of Figure

Notes:

- (1) Type figure number and title underneath figure.
- (2) Maintain minimum margins of 1-¼ inch on sides and 1 inch at top and bottom.

EXHIBIT D

GEORGIA DOT RESEARCH PROJECT 2013

FINAL REPORT

**DESIGN AND OPERATION OF AN ELECTRONIC
SCREENING SYSTEM FOR COMMERCIAL
VEHICLES IN GEORGIA**



**OFFICE OF RESEARCH
RESEARCH & DEVELOPMENT BRANCH**

EXHIBIT E

(Example Title Page—to be used by units of Georgia
Department of Transportation conducting research)

GDOT Research Project No. xxxx

Title of Project (only if different from Title of Report)

Final (or Interim or Technical) Report

TITLE OF REPORT IN CAPITALS

By
Name
Title

Unit of Department Conducting Research
Georgia Department of Transportation

In cooperation with

U.S. Department of Transportation
Federal Highway Administration

Month, Year

The contents of this report reflect the views of the author(s) who is (are) responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Georgia Department of Transportation or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

EXHIBIT F

(Example Title Page—to be used by contractors
conducting research for the Georgia Department
of Transportation)

GDOT Research Project No. xxxx

Title of Project (only if different from Title of Report)

Final (or Interim or Technical) Report

TITLE OF REPORT IN CAPITALS

By
Name
Title

Name of Consultant

Contract with

Georgia Department of Transportation

In cooperation with

U.S. Department of Transportation
Federal Highway Administration

Month, Year

The contents of this report reflect the views of the author(s) who is (are) responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Georgia Department of Transportation or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

EXHIBIT G

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.: FHWA-GA-07-2037		2. Government Accession No.:		3. Recipient's Catalog No.:	
4. Title and Subtitle: Evaluation of the Use of Reclaimed Asphalt Pavement in Stone Matrix Asphalt Mixtures			5. Report Date: August 2007		
			6. Performing Organization Code:		
7. Author(s): Donald E. Watson, P.E.			8. Performing Organ. Report No.: 2037		
9. Performing Organization Name and Address: National Center for Asphalt Technology Auburn University 277 Technology Parkway Auburn, AL 36830			10. Work Unit No.:		
			11. Contract or Grant No.: SPR00-0006-00(357)		
12. Sponsoring Agency Name and Address: Georgia Department of Transportation Office of Research 15 Kennedy Drive Forest Park, GA 30297-2534			13. Type of Report and Period Covered: Final; August 2004-August 2007		
			14. Sponsoring Agency Code:		
15. Supplementary Notes: Prepared in cooperation with the U.S. Department of Transportation, Federal Highway Administration.					
16. Abstract: The objectives of this study were to evaluate the effect of various RAP types and proportions on combined material and performance properties of SMA mixtures. Some of the pertinent conclusions from this study are: <ol style="list-style-type: none"> 1. The addition of RAP may be beneficial for resistance to moisture damage, and adversely affects only the fatigue performance of the mixtures, especially at high strain levels. 2. Adding RAP up to 30% had little effect on the low temperature PG properties. 3. It is recommended that GDOT specifications be modified to allow up to 20% RAP in SMA mixtures with no change in virgin binder grade. Mixtures will still need to meet the same gradation, volumetric, and performance criteria as virgin mixtures. 4. RAP proportions higher than 20% may be allowed, but the virgin binder grade may need to be reduced to improve fatigue performance properties. 					
17. Key Words: Stone Matrix Asphalt, reclaimed asphalt pavement, tensile strength, fatigue, rutting, creep compliance			18. Distribution Statement:		
19. Security Classification (of this report): Unclassified	20. Security Classification (of this page): Unclassified	21. Number of Pages: 65	22. Price:		

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EXHIBIT L

Appendix A Title of Appendix

Note: If appendices are used, the appendix designation and title may be placed on one page, with the appendix material beginning on next right-hand page. Alternately, the appendix designation, title, and material can be contained on the same